

WHAT IS CLAIMED IS

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1. A magnetic recording medium comprising:

a substrate; and

10 a magnetic layer made of a CoCr-based alloy and having a multi-layer structure and disposed above said substrate,

15 said multi-layer structure having a first magnetic layer disposed above said substrate and at least one second magnetic layer disposed on said first magnetic layer on an opposite side from said substrate,

20 said first magnetic layer having a Cr-content larger than that of said second magnetic layer, and having a larger sum total content of nonmagnetic elements which are other than Cr and have a larger atomic radius than Co than said second magnetic layer.

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30 2. The magnetic recording medium as claimed in claim 1, wherein said first and second magnetic layers include at least one nonmagnetic element selected from a group of Pt, Ta, W and B.

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3. The magnetic recording medium as claimed in claim 1, wherein said first and second magnetic layers include approximately 8 to 15 at% of

Pr, and approximately 1 to 6 at% of B.

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4. The magnetic recording medium as claimed in claim 1, further comprising:

a first underlayer made of a Cr-based alloy and disposed on said substrate; and

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a second underlayer made of a Cr-based alloy and disposed between said first underlayer and said first magnetic layer,

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said second underlayer having a larger sum total content of elements other than Cr than said first underlayer.

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5. The magnetic recording medium as claimed in claim 4, wherein said first and second underlayers include at least one element selected from a group of Mo, Ti, W, V and Ta.

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6. The magnetic recording medium as claimed in claim 4, further comprising:

an intermediate layer made of a Co-based alloy and disposed between said second underlayer and said first magnetic layer.

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~~7. The magnetic recording medium as~~

Sub A2

Sub A1
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Sub B1

claimed in claim 1 comprising a plurality of second magnetic layers, wherein:

5 said first magnetic layer has a Cr-content larger than that of a lowermost one of said second magnetic layers disposed closest to said first magnetic layer, and has a larger sum total content of nonmagnetic elements which are other than Cr and have a larger atomic radius than Co than the lowermost one of said second magnetic layers; and

10 between two mutually adjacent second magnetic layers, the Cr-content and the sum total content of the nonmagnetic elements are respectively larger for a second magnetic layer disposed closer to said first magnetic layer.

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8. A method of producing a magnetic recording medium which includes a magnetic layer made of a CoCr-based alloy and having a multi-layer structure, comprising the steps of:

(a) forming a first magnetic layer on a base layer; and

20 (b) forming at least one second magnetic layer on the first magnetic layer,

25 said steps (a) and (b) being carried out so that a Cr-content of the first magnetic layer is larger than that of the second magnetic layer, and a sum total content of nonmagnetic elements which are other than Cr and have a larger atomic radius than Co in the first magnetic layer is larger than that of the second magnetic layer.

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9. The method of producing the magnetic

Sub A2
Cont
Sub B1

recording medium as claimed in claim 8, wherein said steps (a) and (b) form the first and second magnetic layers to include at least one nonmagnetic element selected from a group of Pt, Ta, W and B.

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10. ~~The method of producing the magnetic~~
10 recording medium as claimed in claim 8, wherein said steps (a) and (b) form the first and second magnetic layers to include approximately 8 to 15 at% of Pr, and approximately 1 to 6 at% of B.

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11. The method of producing the magnetic recording medium as claimed in claim 8, further comprising the steps of:

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(c) forming a first underlayer made of a Cr-based alloy on a substrate; and

(d) forming a second underlayer made of a Cr-based alloy between the first underlayer and the first magnetic layer,

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said steps (c) and (d) being carried out so that the second underlayer has a larger sum total content of elements other than Cr than the first underlayer.

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12. ~~The method of producing the magnetic~~
35 recording medium as claimed in claim 11, wherein said steps (c) and (d) form the first and second underlayers to include at least one element selected

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Sub A4 Cont from a group of Mo, Ti, W, V and Ta.

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13. The method of producing the magnetic recording medium as claimed in claim 11, further comprising the step of:

10 (e) forming, as the base layer, an intermediate layer made of a Co-based alloy between the second underlayer and the first magnetic layer.

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14. The method of producing the magnetic recording medium as claimed in claim 11, wherein said step (c) forms the first underlayer at a
20 substrate bias voltage of approximately 0 to -150 V, and said step (d) forms the second underlayer at a substrate bias voltage of approximately -100 to -300 V.

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15. The method of producing the magnetic recording medium as claimed in claim 8, wherein:
30 said step (b) forms a plurality of second magnetic layers;
said steps (a) and (b) are carried out so that the Cr-content of the first magnetic layer is larger than that of a lowermost one of the second magnetic layers disposed closest to the first magnetic layer,
35 the sum total content of nonmagnetic elements which are other than Cr and have the larger atomic radius than Co of the first magnetic layer is larger than

the lowermost one of the second magnetic layers, and between two mutually adjacent second magnetic layers the Cr-content and the sum total content of the nonmagnetic elements are respectively larger for a
5 second magnetic layer disposed closer to the first magnetic layer.

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16. A magnetic storage apparatus comprising:
a head; and
15 at least one magnetic recording medium provided with a substrate, and a magnetic layer made of a CoCr-based alloy, having a multi-layer structure and disposed above the substrate,
said multi-layer structure having a first
20 magnetic layer disposed above said substrate and at least one second magnetic layer disposed on said first magnetic layer on an opposite side from said substrate,
said first magnetic layer having a Cr-content
25 larger than that of said second magnetic layer, and having a larger sum total content of nonmagnetic elements which are other than Cr and have a larger atomic radius than Co than said second magnetic layer.

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